G481

Work, energy and power

Chapter 7

Objectives

State the equation for work done.
Define the Joule.
Explain whether work is done in different situations.
Calculate work done.

Seem familiar?

$1 \text{ J} = 1 \text{ Nm}$

Work done = force x distance moved in the direction of the force

$W = f \times d$

Work done is the energy transferred…

Work is done on the object…

Calculate the work done in raising…

It should do….

What is work done?

When an object is moved through a distance as a result of a force acting on the object, we say that work is done on the object. The work done is the energy transferred to the object.

Work done (J) = Force (N) x   Distance moved in the direction of the force (m)

Hence 1 J = 1 Nm

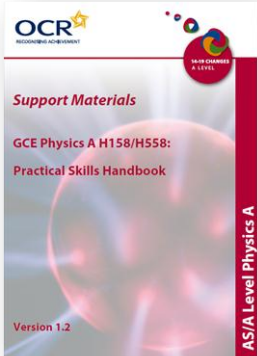This gives rise to the definition of the Joule…

1 Joule is the amount of work done when a force of 1N moves an object a distance of 1m

Doing work or not doing work?

In which of the following scenarios is work being done?
Explain your answers for each…

Scenario 1	Scenario 2	Scenario 3	Scenario 4
Mr Matheson marks AS Level ISA coursework for 2 days.	Mr Abbott's roof blows away. He has a little cry.	Mr Seal holds a copy of OCR Practical Skills Handbook above his head.	Mr Watts cycles to work every day.

OCR
RECOGNISING ACHIEVEMENT

Support Materials

GCE Physics A H158/H558:
Practical Skills Handbook

AS/A Level Physics A

Version 1.2

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1.
   a. Work is done against friction
   b. The force of gravity is doing work. Energy is transferred to you hence you gain KE.
   c. The conker is not gaining KE (it has a constant speed). This means energy is not transferred to it. So work is not done by the tension in the string.
   d. The contact force does not move you in the direction it is acting. No work is done.

2.
   The man has a mass of 70kg. Therefore his weight is 686.7N. His weight acts towards the centre of the Earth. The distance moved in the opposite direction of his weight is 2.5m hence the work he does against gravity is 686.6N x 2.5m = 1716.5 J or Nm

3.
   a.   W = F x d
   In this case the force is the weight, 10N and the distance is 250m hence the work done by gravity equals 2500J.
   b. Since work done = energy transferred, the energy transferred to the stone is also 2500J.

Work done conundrum…

When a skier goes down a slope, work is done by gravity and as a result the skier gains kinetic energy.

Two skiers of equal mass stand on two different slopes. The first slope is 60m high and 200m long. The second slope is 60m high and 400m long.

1. Draw both slopes to scale.
2. Use trigonometry to calculate the angle each slope makes to the horizontal.
3. Calculate the energy transferred to each skier.
4. Explain why your answers to 3. may be different in reality.

A review of the objectives…

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